

## What is claimed is:

**[Claim 1]** An isolated polynucleotide which encodes a *Bacillus thuringiensis* insecticidal toxin protein or insecticidal fragment thereof, active against a lepidopteran insect pest, wherein said insecticidal toxin protein comprises a polypeptide sequence that has at least about 80% sequence identity to a polypeptide sequence selected from the group consisting of SEQ ID NO:4 (TIC900), SEQ ID NO:6(TIC402), SEQ ID NO:8 (TIC403), SEQ ID NO:10 (TIC404), SEQ ID NO:30 (TIC434), SEQ ID NO:12 (TIC961), SEQ ID NO:14 (TIC962), SEQ ID NO:16 (TIC963), SEQ ID NO:18 (TIC965) and SEQ ID NO:20 (TIC966), or a lepidopteran-active insecticidal toxin variant or a portion thereof.

**[Claim 2]** The isolated polynucleotide as in claim 1 wherein said insecticidal toxin protein comprises a polypeptide sequence selected from the group consisting of SEQ ID NO:4 (TIC900), SEQ ID NO:6(TIC402), SEQ ID NO:8 (TIC403), SEQ ID NO:10 (TIC404), SEQ ID NO:30 (TIC434), SEQ ID NO:12 (TIC961), SEQ ID NO:14 (TIC962), SEQ ID NO:16 (TIC963), SEQ ID NO:18 (TIC965) and SEQ ID NO:20 (TIC966), or a lepidopteran-active insecticidal toxin variant or a portion thereof.

**[Claim 3]** The isolated polynucleotide of claim 3 wherein said lepidopteran insect pest is selected from the group consisting of a Noctuidae, a Tortricidae, Epinotia aporema, Anticarsia gemmatalis, Pseudoplusia includens, European Corn Borer (ECB), a Tobacco Budworm (TBW), Black Cutworm (BCW), and a Diamondback Moth (DBM).

**[Claim 4]** The isolated polynucleotide of claim 1 wherein said toxin has a molecular weight between approximately 65 kDa and approximately 70 kDa, and wherein said insecticidal toxin is selected from the group consisting of SEQ ID NO:4 (TIC900), SEQ ID NO:6 (TIC402), SEQ ID NO:8 (TIC403), SEQ ID NO:10 (TIC404), SEQ ID NO:30 (TIC434), SEQ ID NO:12 (TIC961), SEQ ID NO:14 (TIC962), SEQ ID NO:16 (TIC963), SEQ ID NO:18 (TIC965) and SEQ ID NO:20 (TIC966).

**[Claim 5]** The isolated polynucleotide as in claim 4 wherein said isolated polynucleotide is present within a plasmid vector.

**[Claim 6]** The isolated polynucleotide of claim 1 wherein said nucleotide sequence has been optimized for expression in plants.

**[Claim 7]** The isolated polynucleotide as in claim 6 wherein said nucleotide sequence has been optimized for (a) expression in a monocot plant, said optimization comprising one or more of the steps selected from the group consisting of (i) removing polyadenylation sequences, (ii) adjusting the A and T content of the nucleotide sequence to be from about 40% to about 49% without modifying the amino acid sequence of the protein, and (iii) modifying codons in the coding sequence to be consistent with the steps (i) and (ii), or (b) expression in a dicot plant, said optimization comprising one or more of the steps selected from the group consisting of (i) removing polyadenylation sequences, (ii) adjusting the A and T content of the nucleotide sequence to be from about 40% to about 49% without modifying the amino acid sequence of the protein, and (iii) modifying codons in the coding sequence to be consistent with the steps (i) and (ii).

**[Claim 8]** An isolated *Bacillus thuringiensis* insecticidal protein selected from the group consisting of TIC900, TIC402, TIC403, TIC404, TIC434, TIC961, TIC962, TIC963, TIC965, and TIC966.

**[Claim 9]** The isolated protein as in claim 8 wherein said *Bacillus thuringiensis* is selected from the group consisting of EG5438, EG3879, EG4332, EG4971, EG4090, EG4293, EG4611, EG5526, EG5023 and EG4092.

**[Claim 10]** A host cell transformed to contain a polynucleotide encoding an insecticidal protein or insecticidal fragment thereof as set forth in SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:10, SEQ ID NO:30, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, or SEQ ID NO:20, wherein said polynucleotide comprises (1) a nucleotide sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:29, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, and SEQ ID NO:19, or (2) a nucleotide sequence that exhibits from about 60% to about 85% nucleotide sequence identity to a nucleotide sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:29, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, and SEQ ID NO:19.

**[Claim 11]** The host cell of claims 10 wherein said host cell is a plant cell.

**[Claim 12]** A method for controlling a lepidopteran insect pest comprising contacting said pest with a pesticidal amount of an approximately about 65 kDa to approximately about 70 kDa *Bacillus thuringiensis* toxin protein or insecticidal fragment thereof, wherein said toxin protein comprises a polypeptide sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:30, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, and SEQ ID NO:20.

**[Claim 13]** The method of claim 12 wherein said toxin protein is encoded by a nucleotide sequence that hybridizes under stringent conditions to a nucleotide sequence comprising at least 18 consecutive nucleotides selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:29, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, and SEQ ID NO:19.

**[Claim 14]** A method for detecting a nucleotide sequence in a sample, said method comprising the steps of

- (a) selecting a pair of nucleotide primers for use in producing an amplicon from said nucleotide sequence from an alignment of polynucleotide sequences selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:29, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, SEQ ID NO:19;
- (b) producing an amplicon from said nucleotide sequence in said sample; and
- (c) detecting said amplicon.

**[Claim 15]** The host cell of claim 11 comprising a corn plant cell, a wheat plant cell, a rice plant cell, an oat plant cell, an onion plant cell, and a grass plant cell; and wherein said dicot plant cell comprises a cotton plant cell, a canola plant cell, a soybean plant cell, a tobacco plant cell, a fruit tree plant cell, a cruciferous plant cell, a pepper plant cell, an ornamental plant cell, a sunflower plant cell, a cucurbit plant cell, and a melon plant cell.

**[Claim 16]** A method for expressing a lepidopteran-active toxin protein in a plant, comprising the steps of:

- (a) inserting into the genome of a plant cell a nucleic acid sequence comprising in the 5' to 3' direction an operably linked recombinant, double-stranded DNA molecule, wherein the recombinant, double-stranded DNA molecule comprises:
  - (i) a promoter that functions in the plant cell;

- (ii) a nucleotide sequence encoding an insecticidal amino acid sequence as set forth in SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:30, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:18, or SEQ ID NO:20; and
- (iii) a 3' non-translated nucleotide sequence that functions in the cells of the plant to cause termination of transcription;
- (b) obtaining a transformed plant cell containing the nucleic acid sequence of step (a); and
- (d) generating from said transformed plant cell a plant that expresses the lepidopteran-active toxin protein in the transformed plant..

**[Claim 17]** A seed from the transformed plant of claim 16, wherein said seed comprises said nucleic acid sequence.

**[Claim 18]** Progeny of the seed of claim 17 wherein said progeny comprise said nucleic acid sequence.

**[Claim 19]** The transformed plant of claim 16 wherein said plant cell is (a) a monocot plant cell comprising a corn plant cell, a wheat plant cell, a rice plant cell, an oat plant cell, an onion plant cell, and a grass plant cell, or (b) a dicot plant cell comprising a cotton plant cell, a canola plant cell, a soybean plant cell, a tobacco plant cell, a fruit tree plant cell, a cruciferous plant cell, a pepper plant cell, an ornamental plant cell, a sunflower plant cell, a cucurbit plant cell, and a melon plant cell.

**[Claim 20]** A biological sample derived from the tissues or seed of the plant of claim 18 wherein the sample comprises a detectable amount of said nucleotide sequence.